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BIOLOGICAL BULLETIN

ON THE NORTH AMERICAN MARINE TRICLADS.

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During the last fifty years ten marine species of triclads were found on the east coast of North America :

Procerodes wheatlandi Girard (according to Verrill = *Procerodes ulvæ* (Oe.), according to Curtis = *Gunda segmentata* Lang).

Procerodes frequens Leidy (according to Verrill = *Procerodes wheatlandi* Gir.).

Fovia (*Vortex*) *warreni* (Gir.).

Fovia (*Planaria*) *grisea* (Verrill).

Fovia affinis (Oe.) (var. *warreni* and var. *grisea*).

Fovia (*Planaria*) *littoralis* (Verrill).

Bdelloura (*Vortex*) *candida* (Gir.) (= *Bdelloura parasitica* Leidy = *Planaria limuli* v. Graff).

Bdelloura propinqua Wheeler.

Bdelloura rustica Leidy.

Syncoelidium pellucidum Wheeler.

The identifications for the most part of these are quite doubtful, because of the incomplete description ; also the identifications of these species with European species, given by some authors, are untenable. I studied these North American species in the most important localities and in the following paper I shall give a short notice of my results. I am not concerned with the *Bdellouridæ* (genera *Bdelloura* and *Syncoelidium*), living on *Limulus*, because these have already been well described by Wheeler.¹ *Bdelloura rustica*, a free-living form, described by Leidy² cannot be identi-

¹ Wheeler, W. M., " *Syncoelidium pellucidum*, a New Marine Triclad," *Journ. Morph.*, Boston, 1894, pp. 167-194, Pl. 8.

² Leidy, T., " Helminthological Contributions," No. 3, *Proc. Acad. Nat. Sc.*, Vol. V., Philadelphia, 1850/51, pp. 242, 243, 289.

fied as such and doubtless it does not belong to the genus *Bdelloura*. Also I have published a paper¹ on the larvæ of planarians, named by Agassiz² *Planaria angulata* and the probable confusion of these with young *Bdellouridæ*. The following communication concerns only the free-living marine triclads.

Girard³ described in 1850 a marine triclad, found near Manchester (Massachusetts Bay) under the name *Procerodes wheatlandi* n. gen. n. sp. The same animal was found by Leidy (9) in 1855 near Point Judith, R. I., and was described as *Procerodes frequens* n. sp. Neither species was investigated in relation to the genital apparatus and nevertheless Verrill (10), in 1873, identified them with the North European species *Gunda ulvæ* (Oe.).³ Girard⁸ called the first species by its old name *Procerodes wheatlandi* but the second and the third (European) species he classed with the *Rhabdocoelidæ* (!) under the name of *Neoplana* n. g. *frequens* and *N. ulvæ*. Curtis¹ supposed that Verrill's *Procerodes ulvæ* (*Procerodes wheatlandi* + *Procerodes frequens*) may be identical with the South European *Procerodes* (*Gunda*) *segmentata* (Lang).

Without mentioning the mistake of Girard, there are two questions to answer: (1) Is *Procerodes wheatlandi* (*Procerodes frequens*) identical with one of the European triclads *Procerodes ulvæ* or *Procerodes segmentata*? (2) Must the European genus *Gunda* O. Schm. (+ *Haga* O. Schm.) be classed with the American genus *Procerodes*?

In relation to the last question Bergendal⁴ correctly mentioned that for the present the well-described genus *Gunda* must be preferred to the insufficiently described genus *Procerodes*. Böhmig⁵

¹ Wilhelmi, J., "Über *Planaria angulata* Müller," *Zool. Jahrb.*, Abth. Systematik, 26. Bd., 1907, 10 pp., 1 Taf.

² Agassiz, A., "On the Young Stages of a Few Annelids," *Ann. Sc. N. H.*, New York, 8. Bd., 1866, pp. 306-309, Taf. 1, figs. 1 u. 2.

³ Oersted, A. S., "Forsøg til en ny Classification of Planarierne (*Planaria* Dugès) etc.," *Kroyers Naturh. Tidsskrift*, IV., 1843, p. 551.

⁴ Bergendal, D., "Studier öfver Turbellarier. 2. Om Byggnaden af *Uteriporus* Bgdl. jämte andra bidrag till Tricladernas anatomi." *Fysiogr. Tällsk Lund Handl.* (2), Bd. 7, 1896. — Ueber drei Tricladen aus Punta Arenas und umliegender Gegend," *Zool. Anz.*, 22. Bd., 1899.

⁵ Böhmig, L., "Turbellarienstudien: *Tricladida maricola*," *Zeitschrift f. wiss. Zool.*, 81. Bd., 1896.

referred to the same question : " Die von Girard gegebene Charakteristik des Genus *Procerodes* ist eine sehr oberflächliche, sie bezieht sich nur auf das Extérieur, während die Beschreibung und Abbildungen O. Schmidt's (*Gunda*) genügend kennzeichnende sind. . . . Mit Rücksicht auf die grosse Uebereinstimmung, welche sich hinsichtlich der Form zwischen *Procerodes* und der überwiegenden Mehrzahl der *Gunda*-Arten ergibt, mit Rücksicht weiterhin auf den Umstand, dass wenigstens eine sichere *Gunda*-Species an der Nordamerikanischen Küste beobachtet wurde ("but it was not"), acceptiere ich die *Girard'sche* Bezeichnung, obwohl der Copulations-apparat von *Pr. wheatlandi* total unbekannt ist und den Zweifeln, die Bergendal bezüglich der Identität von *Procerodes* und *Gunda* äussert, eine Berechtigung nicht abgesprochen werden kann. Mit Sicherheit lässt sich diese Frage nur durch die Untersuchung der Originalexemplare von *Pr. wheatlandi* entscheiden, . . . "

I studied the above mentioned North American¹ and European² species and found that following Verrill the genus *Gunda* O. Schm. because of the agreement of the genital apparatus of *Procerodes wheatlandi* with this of European *Gunda*-Species must be classed with *Procerodes*. But *Procerodes wheatlandi* (and *frequens*) is not identical with *Procerodes (Gunda) ulvæ* although they closely resemble one another. Also Curtis'¹ supposition given in a short notice, "The occurrence of *Gunda segmentata* in America," that *Procerodes wheatlandi* may be identical with the South European species *Gunda segmentata*, and not, as Verrill supposed, with *Procerodes (Gunda) ulvæ*, is a mistake. *Procerodes segmentata*³ is quite free from pigment and therefore, setting aside the different forms of the head will be easily distinguished from the North American *Procerodes wheatlandi* and the North European *Procerodes (Gunda) ulvæ*.

Nearly contemporary with the description *Procerodes wheat-*

¹ Collected at Cuttihunk (Elizabeth Islands) and Newport, R. I. ; through the courtesy of Professor Curtis I obtained also the original material of his *Gunda segmentata* from Sandwich, Mass., where I myself unsuccessfully sought for these species. I found it in Buzzards Bay, near Sandwich, summer 1907.

² I collected it at Travemünde and Copenhagen in September, 1906.

³ I collected it during the last three years at Naples and many other localities of the Mediterranean Sea.

landi Girard (3) described a second new marine triclad from Boston Bay, *Vortex warreni* n. sp., for which later he established the new genus *Fovia* (7). Verrill (10) in 1873-74 described the same species as *Planaria grisea* n. sp. and later as *Fovia littoralis* n. sp. (11). The descriptions of these species and of the genus *Fovia* are insufficient. Already in 1857 Stimpson¹ classed the European *Planaria affinis* Oe. with the genus *Fovia* and Verrill (12) identified the preceding North American species with Stimpson's *Fovia affinis* (Oe.) as varieties *warreni* and *grisea*. Girard (3) meanwhile cites *Fovia warreni* as a marine triclad (with anus) and classed the identical *Fovia grisea* with his new rhabdocœlid (!) genus *Neoplana*. From the North European *Fovia affinis* I studied the only three existing individuals of the Museum of Bergen and showed² that probably it is a fresh-water form, which sometimes occurs also in brackish and sea-water, perhaps *Planaria torva* Müll. The American species *Fovia warreni* and *grisea* (*littoralis*³) spoken of by Verrill as *Fovia affinis* (Oe.) belong to only one species of the genus *Procerodes*, which must be designated *Procerodes warreni* (Gir.); the variations of color not being greater than usual in sea- and fresh-water-planarians, do not allow of forming separate varieties; the genus *Fovia* must be included in the genus *Procerodes*. Girard (4, 7, 8) described it as viviparous: the larvæ resemble the adult animal, but its anterior end is less truncated. Eyes are still absent in the larvæ, but the position of these is indicated by two transparent spots; a canal in the middle of the body is interpreted as the alimentary tube.

These "larvæ" are protozoans (*Hoplitophrya*), living in the cavity of the pharynx and in the intestine of triclads. M. Schultze⁴ found them in *Procerodes* (*Planaria*) *ulvæ* of the Baltic Sea and described them under the name of *Opalina uncinata*. I myself found them in large numbers in *Procerodes segmentata*

¹ Stimpson, W., "Prodromus, etc., *Proc. Acad. N. Sc. Philadelphia*, 1857.

² Wilhelmi, J. "Über *Planaria affinis* Müller." *Bergens Museums Aarbog*, 1907, Nr. 4.

³ I collected them at Woods Hole and neighborhood and at Massachusetts Bay, summer, 1907.

⁴ Schultze, M., "Beiträge zur Naturgeschichte der Turbellarien," I. Abtheilung, Greifswald, 1851.

(from the Bay of Naples, the Mediterranean and Black Sea), in *Procerodes ulvæ* (from the Baltic Sea) and also in the free-living North American marine triclads. They live principally in the cavity and the ramifications of the gut without damaging the host. The transparent spots called by Girard the first traces of the eyes, correspond to the organs of attachment and the alimentary tube answers to the nucleus of the *Hoplitophrya uncinata*.

With a detailed study of these Prof. M. M. Metcalf is occupied; at present he has given some notices on its excretory organs.¹

I shall give in my monograph of the marine triclads an anatomical and histological description of these free-living North American marine triclads.

I append the list of the places on the east coast of North America, where these free-living triclads have been found, and indication of the corresponding literature.

Bay of Fundy, *Procerodes wheatlandi* (*ulvæ*) 1893 Verrill (12).

Eastport, Me., *P. (Fovia) warreni* 1893 Girard (8).

Grand Manan, N. Br., *P. wheatlandi* 1854 Girard (6).

Grand Manan, N. Br., *P. (Fovia) warreni* 1893 Verrill (12).

Casco Bay, Me., *P. wheatlandi* (*frequens*, *ulvæ*) 1873 and 1893 Verrill (10) (12).

Casco Bay, Me., *P. (Fovia) warreni* 1873 Verrill 1893 (10).

Casco Bay, Me., *P. (Fovia) warreni* (*grisea*) 1893 Verrill (12).

Cape Elizabeth, Me., *P. (Fovia) warreni* (*affinis*) 1873 Verrill (10).

Gloucester, Mass., *P. wheatlandi* (*ulvæ*) 1893 Verrill (12).

Manchester, Mass., *P. wheatlandi* 1850 and 1851 Girard (2) (5).

Beverly, Mass., *P. (Fovia) warreni* 1893 Verrill (12).

Chelsea Beach, Mass., *P. (Fovia) warreni* 1852 Girard (7).

Boston Harbor, Mass., *P. (Fovia) warreni* 1850 Girard (4).

Sandwich, Mass. (Cape Cod Bay), *P. wheatlandi* (*Gunda*) *segmentata* 1900-01 Curtis (1).

Woods Hole, Mass., *P. (Fovia) warreni* 1873-74 Verrill (10).

Woods Hole, Mass., *P. wheatlandi* (*ulvæ*) 1893 Verrill (12).

Vineyard Sound, *P. wheatlandi* (*frequens*) 1855 Verrill (10).

¹ Metcalf, M. M., "The Excretory Organs of *Opalina*," Part II., *Arch. f. Protistenkunde*, 10. Bd., 1907.

- Newport, R. I., *P. wheatlandi* (*ulvæ*) 1893 Verrill (12).
 Point Judith, R. I., *P. wheatlandi* (*frequens*) 1855 Leidy (9).
 Watch Hill, R. I., *P. (Fovia) warreni* (*grisea*) 1872 Verrill (10).
 New Haven, Conn., *P. wheatlandi* (*frequens*) 1873 Verrill (10).
 New Haven, Conn., *P. wheatlandi* (*frequens*, *ulvæ*) 1893 Verrill (12).

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